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East Europe Report

SCIENTIFIC AFFAIRS

No. 760

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CONTENTS

BRIEFS

SOLAR COLLECTORS FOR FODDER DRYING--PRAGUE, 6 Oct--Seventy-thousand square metres of solar collectors should be available for water heating and 20,000 for fodder drying in Czechoslovakia in 1985. Due to increasing lack of classic energy resources solar energy is planned to be used as a complementary energy source shortly. For example, in 1985 solar energy and heat pumps should replace 66,000 tonnes of standard fuel and in 1990 already 175,000 tonnes. The average useable solar energy on most of Czechoslovak territory is 970 to 1,130 kwh per square metre annually. In some regions, for example, in southern Moravia and south-east Slovakia, 1,270 kwh per square metre are available. [Rangoon THE WORKING PEOPLE'S DAILY in English 8 Oct 82 p 2]

CSO: 2020/1

NATIONAL CONFERENCE ON AUTOMATED TECHNICAL PLANNING

Budapest SZAMITASTECHNIKA in Hungarian No 7-8, Jul-Aug 82 p 2

[Unsigned article: "First National Conference on Automated Technical Planning," to be continued]

[Text] The conference, which was accompanied by extraordinarily great interest, was held between 22 and 26 March by the MTA [Hungarian Academy of Sciences] SZTAKI [Computer Technology and Automation Research Institute] with the cooperation of a number of scientific associations and the OMFB [National Technical Development Committee].

It is nearly 10 years since experts dealing with AMT [computer aided design] problems (the English abbreviation is CAD) have been active in a coordinated way in our homeland. Despite the serious difficulties in obtaining tools, significant research, development and applications results have been achieved and the theme continues to be followed with special interest.

The sections of the conference dealt with electronic and electrotechnical problems (6 sections), machine industry problems (6 sections), construction industry problems (4 sections), technological installation design problems (3 sections), educational problems, problems in applying the finite element method and general device and methodological problems of CAD.

The number of papers read was over 150.

The opening address was given by Tibor Vamos, director of the SZTAKI. He emphasized the timeliness and significance of the conference. He said that the organizers, in the interest of swift arrangements, had abandoned prior publication of the papers and would recommend publication in the professional press on the basis of merit.

The plenary presentations on opening day were given before 150-200 participants.

The chairman's opening address was given by Antal Jantner, deputy minister of the EVM [Ministry of Construction and Urban Development] and chairman of the CAD work committee of the Computer Technology Applications Council, with the title "The Status and Tasks of CAD." He noted that as the scientific-technological revolution

accelerated the development of products and technological processes there was a swift increase in variety. Products and technological processes must be replaced more quickly, which increases the work connected with preparation. This phenomenon makes it necessary to increasingly include computer design methods in technical planning in order to ensure the economicalness, utility and marketability of manufactures and products. He spoke about the possibility of using methods based on comparison of several alternatives or on exact optimization and about the significance of technical-economic data banks.

Concerning construction industry CAD he said, among other things: "We are trying to introduce CAD in the construction industry in the interest of the following goals: Developing and spreading construction industrialization including modular construction, developing housing and communal construction, improving the technical planning level of maintenance construction, making planning work better organized, improving efficiency and reducing costs, better utilization of intellectual (engineers') work, making alternative planning general, improving the quality of structures, reducing construction and operating costs (energy needs), and better design preparation for finishing work. In sum, increasing the efficiency of investments.

Computer aided technical design is being developed within the framework of the computer technology target program of the EVM, with the partial support and guidance thereof.

"The target program is more than 10 years old. In the course of its activity it strives to define the guidance of both hardware and software development.

"The branch was backward at the beginning of the Fourth 5-Year Plan. But by 1975 the available equipment had increased from 4 computers to 34. In addition to the central Siemens computer investment the EGSZI [Institute of Construction Management and Organization] began development of a branch network based on ESZR [Uniform Computer Technology System] machines and the planning enterprises got small computers of the VT and TPA [stored program data processing] type and desk, programmable electronic computers (EMG and COMPUCORP).

"The branch computer network based on the ESZR was built up during the Fifth 5-Year Plan (with four provincial regional centers). The central Siemens machine was expanded and it became possible to begin dialog mode applications, via a multi-terminal system, among the planning enterprises. Equipping provincial planning enterprises, primarily, with small TPA computers continued.

"By the end of the plan period there were 110 computers in operation in the area of the branch, counting micro, mini and small computers."

The deputy minister had the following to say, inter alia, about the goals of the Sixth 5-Year Plan in the area of construction industry CAD: "In the area of computer aided technical design we must gradually make general the interactive design methods." Within the framework of the target program they have prescribed the following concrete program developments, and have begun to work them out:

Display of two or three dimensional figures on automatic drawing boards and screens, development of interactive engineering work positions, computer aided systems for panel construction systems, computer aided design systems for prefabricated reinforced concrete construction systems, computer aided planning of water supply and sewerage for housing developments, development of computer aided cell variant planning methods for housing and communal buildings, developing computer data banks of standardized structures, computer program systems for statics and strength measurements, and computer programs for building mechanics and physics measurements.

In his plenary address titled: "Domestic CAD Work, Its Coordination and International Cooperation," Janos Somlo, a main department chief at the MTA SZTAKI, reported on the efforts made in the area of coordinating domestic work and cooperation projects with socialist countries on the basis of an agreement between the MTA and the OMFB, under the leadership of Gyorgy Paris and, later, the speaker. The section breakdown of the conference also reflects that the most significant activity has been conducted in the area of the machine industry, construction industry and electronics. The speaker emphasized the merits of Arpad Csurgay, Gyorgy Gardos, Laszlo Fauszt, Jozsef Hatvany, Matyas Horvath, Gyula Pati and Tamas Roska in domestic CAD work.

He emphasized that, in his opinion, clear ideas about the role and methods of computerized design in the coming decades developed relatively early in our homeland, at the beginning of the 1970's. This was clearly reflected by the studies of the OMFB and the SZATI (Computer Technology Office) dealing with this theme, which played a significant role in coordinating the work. The speaker said that the shortage of tools is significant, many commercial questions await solution, there is a shortage of adequate knowledge, experience and experts and how to encourage work and transmit and receive results has not been worked out.

Despite the spread of ESZR and MSZR [Minicomputer System] devices adequate exploitation of the gigantic potential possibilities of socialist international cooperation is held back by the significant differences in the area of the device base, by the shortage of interactive, graphic devices, by obstacles of an administrative character to the transmission and reception of achievements and by the unsolved nature of incentive and economic questions.

In conclusion, he said that he considers the development of domestic professional culture to be one of the greatest merits of coordinated CAD activity. It is certain, looking to the future, that CAD systems will spread in instruction.

Among the activities in other areas one might mention the IDMS program system acquisition started at the initiative of CAD, the significance of which goes beyond the CAD frameworks. A new initiative is the acquisition of a program package realizing the ASKA finite element method.

A number of partial results have been achieved in the area of the machine industry, among which we might mention the integrated technological planning system; its principles are outstanding and it makes excellent use of the achievements of socialist cooperation. In connection with the CAD achievements of the construction industry the speaker called attention to what had been said in the address by Antal Jantner.

The electronics CAD achievements are outstanding. The AUTER [automatic design] system developed through the cooperation of a number of enterprises and institutes (TKI [Telecommunications Research Institute], SZTAKI, KFKI [Central Physics Research Institute], SZKI [Computer Technology Coordination Institute], HIKI [Signal Technology Industry Research Institute], MIKI [Instrument Industry Research Institute], and BME [Technical University of Budapest]) will be installed in five industrial enterprises in the current 5-year plan, making possible the practical testing of research and development results and the solution of planning and design tasks appearing in great numbers in industry.

Jozsef Hatvany, scientific consultant for the SZTAKI, reviewed the development of CAD devices and applications spreading with extraordinary speed throughout the world. A certain polarization can be observed; on the one hand there are large systems combining increasingly more complex tasks and on the other hand there is a trend toward ever cheaper small systems, largely of the "key transmission" type. The results achieved in the areas of modern operating systems, high level programming languages, new data base management systems, networks and computer graphics have made the development and application of CAD many times more efficient. Systems serving the designer and using artificial intelligence research indicate the path of the future. At the same time we must be careful of demanding always the newest and greatest performance; here also engineering decisions must seek technical-economic compromises.

Arpad Csurgay gave a talk entitled "Modeling and Algorithmizing Problems in Product Development." Starting from an analysis of the process of product development he introduced a ramified system of models and algorithms for automated technical design. The person developing the product must have adequate information about the factory in which the developed product will be produced. From the viewpoint of the designer the factory can be modeled well with the TGE (planned-manufacturing-control) system model, knowing the chief phases of the design process can be formalized. Planning itself is a series of intuitive and algorithmizable "transformations" which produce full documentation for manufacture and control step by step from the specifications. Building on the disciplines of some special area it is possible for the designer [line missing from original], probably: "to develop an infinite number of articles"] from a finite number of models and algorithms. This requires that the models of the article to be designed and the designing algorithms should "develop" in the course of the planning process so that the article can be described in ever greater detail while ever more complex models preserve the information content of the simpler models.

The speaker showed, using the example of a design process for electronic circuits, how the processing of models and algorithms, independent of computer and of technology, fitting standardized design procedures to concrete technologies and with a data base processing of the TGE system model leads to the development of portable design systems making use of the advantages of ever more developed hardware and software environments.

Without trying to be complete, we can report the following about the section papers.

There were papers on the following themes in the area of electronic-electrotechnical CAD applications: the AUTER system and its industrial introduction, electronic planning methods and designing systems, electrotechnical design, filter design, and interactive graphics in electronic design.

Considering that since the end of the 1960's there have been CAD sections (with "mechanical design methods" and at similar titles) a number of domestic conferences in the electronics area (the great majority of the papers dealt with this) we will emphasize the new aspects here.

Following wide-scale industrial installation (the AUTER system) and use the speakers began to include experts using enterprise CAD systems in a creative way and developing them further and the electrotechnical applications, forced into the background earlier, came to the fore also.

Let us first note representative presentations from these two areas. They well reflect the role and effect in applications of the TGE model discussed in the earlier reported plenary lecture (Arpad Csurgay).

The three largest enterprise electronics design systems are the AUTER MPC systems of the EMG [Electronic Measuring Instruments Factory], TERTA and the BHG [Beloiannisz Signal Technology Factory]. Four papers reported on the achievements of the collectives actively using them (Zoltan K. Szabo; Pal Geza Nagy and Antal Kovacs; Janos Horvath; and K. Istvan Gyalai, Gyorgy Mihalyi, Andras Estok and Erno Pracser). The first system installed, at the EMG, already works in two shifts and the enterprise TGE process is based on it. The AUTER MPC system is a turnkey system based on a TPA 1140 computer (supplied with graphic machines, digitalizers, etc.), aiding the design and documentation of electronic equipment assembled on printed sheets. It was developed as part of the target task with the designation SZKCP [Computer Technology Central Target Program] CF22 within the framework of the AUTER program (Imre Abos and Ferenc Bati described the system).

It is worthy of note that the integration of a designing system in the life of an enterprise brings great changes in the technology of enterprise development and that a number of enterprises have installed the same designing system (these also serve as background machines for each other). They also automatically solved the standardization of product documentation for these enterprises.

In a comprehensive lecture in the electrotechnical section Mihaly Szaniszlo talked about an integrated adaptive planning system for electric networks and new control technology systems, making special mention of the place and role of the CAD system.

The many valuable papers also showed that in the course of enterprise introductions on the basis of the achievements of the past 5-year plan there had been a breakthrough in mass use, and many collectives are working on the solution of various practical tasks.

The extraordinary activity of the participants in the sessions of the electronic and electrotechnical CAD section was outstanding. The exchange of information between those dealing with immediate scientific themes and the users of various applications systems was significant. Filter design was characteristic of the first group and lectures and debates by AUTER users were characteristic of the second.

The professional debates and dialogs "swept away" the crowded program and "enchanted" the participants making use of the rare opportunity.

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SPECIFICATIONS OF ORION-KFKI ADP 2052 DISPLAY TERMINAL

Budapest SZAMITASTECHNIKA in Hungarian No 7-8, Jul Aug 82 p 7

[Article by Dr Istvan Lang and Dr Laszlo Tamas Sandor, KFKI [Central Physics Research Institute]: "The Most Extensively Used--The Alphanumeric," continuation of a series on CRT displays]

[Excerpt] The other chief group consists of terminals used in systems made up of small computers, primarily for business purposes, in small computer configurations. Characteristic examples are the VT52 and VT100 alphanumeric displays of the Digital Equipment Corporation. Displays corresponding to these terminals are already manufactured in our homeland also. One terminal type is the Videoton VDT 52100 display terminal family and the other is the Orion-KFKI ADP 2052 universal display terminal. Since industrial series manufacture of the latter has only just begun and its parameters may be less known we will briefly summarize its construction and services.

The Orion-KFKI ADP 2052 Universal Display Terminal

Use of the most developed achievements of highly integrated semiconductor technology (LSI) made possible the development of the universal display terminal. The terminal, which contains microprocessor, RAM and PROM memory also contains a programmable screen control.

When realizing a given screen specification this design not only makes it possible to manage the communications protocol of the terminal with a program but also to use a program to set the desired screen format (number of lines and characters, etc.). This means that one can create different display terminal specifications with the same hardware design (by exchanging the burned-in operating programs, or firmware). This is favorable for both the manufacturer and the user. The manufacturer can standardize the manufacture of displays with different specifications and it is advantageous for the user because if he needs a display with different specifications he need only exchange the firmware in the apparatus.

At present there are versions satisfying the DEC VT52 and VT100 specifications.

Thus the universal display terminal is suitable for the realization of various display specifications.

The universal display terminal is a modern information input and output device from the viewpoint of the linked computer. As compared to the usual screen display specifications it has the following additional possibilities and services.

Supplementary Keyboard

In addition to the normal alphanumeric keyboard one can find, in a separate group, a supplementary keyboard consisting of 19 keys which, on the one hand, facilitates the swift, error-free input of numeric data and cursor movement and, on the other hand, generates, in the so-called functional mode, a special series, "message sequences," which can be interpreted in a manner determined by the user and are used to produce relatively complex, programmed sequences of activities.

Picture Content Preservation Mode

With this operational mode the operator can control the speed of receiving data from the computer and the speed of transmitting data. If the screen is filled an additional line of new information can come in only if the operator permits it by pushing the SC (scroll) key. In a manner similar to the above the writing or display of a full screen of new information can be authorized by pushing the PG (page) key.

Preparing Copy

A line printer can be connected to the terminal. The screen contents can be printed on it line by line or in their entirety.

Graphic Mode

In the graphic mode it is possible to display 32 symbols determined by the user. This helpe to display graphs, tables and process diagrams.

Technical Data of the ADP 2052

Display format: 24 lines, 80 characters per line. Character matrix: 6 x 8 raster points. Character assortment: 96 ASCII characters (upper and lower case letters, numbers, punctuation) plus 32 user defined symbols in the graphic mode. Keyboard: an alphanumeric keyboard consisting of 62 keys and a space bar to produce the entire 7 bit ASCII character series, an operational mode control keyboard consisting of 10 keys and a functional keyboard consisting of 19 keys for cursor movement, supplementary numeric data input or control in the functional mode. Cursor: movable in four directions, can be tabbed, can "jump" to a desired position, flashing, and non-destructive underlining (does not hinder display of character). Monitor: an Orion DME-028/AT type, 28 centimeter diameter, green CRT (power--220 V, 50 Hz, 25 VA). Communication: serial asynchronous transmission in accordance with the V.24 prescription, full duplex transmission, transmission speed can be set at 75, 110, 150, 300, 600, 1,200, 2,400, 4,800 or 9,600 baud.

Line printer which can be connected directly: a DZM-180 matrix printer with a speed of 180 characters per second; printing of graphic elements can be changed by exchanging the EPROM; power--220 V, 50 Hz, 80 VA.

NEW ROBOTRON MICROCOMPUTER SYSTEM

Budapest SZAMITASTECHNIKA in Hungarian No 7-8, Jul-Aug 82 p 7

[Article by Egon Hoffmann: "New Robotron Microcomputer System"]

[Text] In recent years Robotron has developed and manufactured a series of microcomputers or microcomputer systems which are used in distributed systems, as office computers, basic computers, data collection systems, word processors, or programmable terminals in various areas of the economy.

Application Examples

Control of numeric machine tools; to control shelf servicing devices in warehouses; to control chemical industry gas chromatographs; automatic surface water control; industrial robots; control of induction smelting furnaces and 500 MW power plant blocks; ticket punchers and dialog automats in transportation; building material weighing and dispensing equipment; and on-board computers for urban railways.

In addition to the K 1510 microcomputer they are manufacturing primarily the K 1520 (8 bit) and K 1600 (16 bit) microcomputers. They are manufacturing large numbers of the latter with 64 K byte and 256 K byte storage capacity.

In 1981 they produced 12,500 of the K 1520 types alone.

Operation of the Robotron 238 Multitask Microcomputer

If some problem cannot be solved with a single microcomputer then one can use specially developed hardware, or a larger capacity and more expensive computer, or several microcomputers. The last possibility can be used advantageously if the task to be solved can be broken down into many tasks which can be performed in parallel. Examples of this are a patient care (supervision) system in health affairs or the auditing, control and management of complex equipment or processes.

The Robotron 238 multitask microcomputer has an addressable area of 1 M bytes built from the 8 bit microprocessor switching current family and RAMs of 32 bytes per processor. This is an OEM unit which was developed for the realization of especially complex multitask microcomputer configurations, where connection via a universal bus proves most useful.

Connection of functional modules via a universal bus is internationally recognized.

The advantages of the Robotron 238 for system organization, testing and debugging are:

--a real multi-computer organization can be realized;

--every single (SBC) processor can access the entire addressable area (1 M byte) and can operate as both processor and as I/O processor; its operating mode can be changed dynamically;

--it has all functions necessary for handling resources and for process synchronization, which are usually missing in ordinary microcomputers;

--the floppy disk unit makes possible swift and reliable loading of software components;

--a special error correction code applied to the floppy disk guarantees correction of burst errors to a length of 128 bits;

--the system also accepts a soft sector formalized disk, and ensures convertibility of them;

--it has built-in protection devices for error recognition, parity check, memory protection and time control;

--special diagnostic states and a comparison stop mode can be set for program testing. This takes place in the SBC with an appropriate reduction of data transmission speed, without influencing the real time relationship on the universal bus;

--a separate microcomputer serves as bus control for control of the bus processes, automatic error handling and the maintenance system.

These devices ensure that one need not use auxiliary devices as a logical analyzer to test user programs, or use in-circuit emulation and other similar complex external auxiliary devices in developmental systems.

The maintenance system of the Robotron 238 carries out the following essential functions in order to do this: displaying (printing) and changing memory and register contents; control of the comparison stop mode; starting and stopping programs; checking, copying and converting diskettes; and starting tests for the system and for external equipment.

An entire series of diagnostic routines are available to test hardware, as well as test programs for signal checks.

The maintenance system is handled with the aid of keyboard and screen, which ensures convenience. Operating guides can be queried directly with the aid of the Help function.

In the event of a more serious hardware problem the diagnostic routines can be initiated with a plug-in diagnostistic adapter.

Functional Modules

The Robotron 238 multitask microcomputer system is constructed in the following functional modules on 390 x 270 mm circuit panels:

One Single Board Computer (SEC): a complete microcomputer with CPU (U 880), I/O units (1CTC, 1 S10, 3 PIO), storage units (4 K byte PROM, 32 K byte RAM), RAM dual access (its own CPU and the universal bus), parity check, memory protection, a comparison stop mode unit, and control and error condition registers accessible by program.

Four Standard Interface Adapters (SIFAD)

These make possible connection to the usual computers via an ESZR or IBM standard interface with the following devices: its own microprogram control; simultaneous control of a maximum of eight device functions with four different command series; connection possibilities to byte multiplex, block multiplex or selector channels; connection devices for debugging via software and hardware diagnosis.

Available as supplementary building element groups are: keyboard, maintenance panel, daily clock (adapted to the site), floppy disk drive unit adapter, printer adapter, screen monitor, current supply and assembly accessory.

The software and documentation include: diagnosis routines, a maintenance system, a real time monitor system, a floppy disk access system, hardware description, a programmer's handbook and complete error localization documentation, which locates faulty components with signal analysis.

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SEMICONDUCTOR STORE FOR TELE JS REMOTE DATA PROCESSOR

Budapest SZAMITASTECHNIKA in Hungarian No 7-8, Jul-Aug 82 p 7

[Article by Janos Mikcsak: "Semiconductor Store for TELE JS Remote Data Processing Processor"]

[Text] It is well known that the remote processing processors of Polish manufacture are delivered with a ferrite ring operating store. The modularly constructed unit can have a maximum of 256 K bytes made up of two 128 K byte blocks. The first 128 K bytes and complementary power units are placed in the processor cabinet. An expansion cabinet is needed for the additional 128 K byte block. Further modularity within the 128 K byte unit ensures very good organizing ability. The unit is made up of exchangeable 16 K byte cards and in event of failure can be made operational again within minutes.

The processor connected to the SZAMALK [Computer Technology Applications Enterprise] ES 1055 computer had a capacity of 48 K bytes. This capacity was amply sufficient for the EP/JS emulator program (which emulated an IBM 270X multiplexor), one of the service programs used. But the network control NCP/JS program needed a minimum of 48 K bytes or more storage capacity.

We had to increase the size of the ES 8371.01 operating store.

One way to realize the expansion would have been to buy additional 16 K byte ferrite cards. Because of the very high acquisition price we were forced to disregard this solution. The other route was to study the possibility of using domestic semiconductor stores made for the ESZR [Uniform Computer Technology System] series 1 computers. We found that, due to the modular similarity and the availability of a power supply, a simple processor store interface made possible the realization of the maximal semiconductor store in the processor cabinet in the place of the ferrite store. We asked the experts of the NIM [Ministry of Heavy Industry] IGUSZI [Institute of Industrial Economy and Business Organization] to make a 256 K byte semiconductor store based on the OL-603 semiconductor store elements developed by them earlier.

The new store consists of sixteen 16 K byte cards and two adapter cards. They used 4 K bit static RAM circuits as the storage element. The unit is placed in a standard rack drawer and can be fitted in the place of the ferrite block

with a screw. Installation is simple. The connector of the processor store interface cable connects from the old store to the semiconductor store, and 5 V power is supplied with some sort of stabilizer. We had to have an additional address line to address the second 128 K bytes, but this could be done with the unused line of the existing interface cable.

Installation and alignment of the prototype took 2 x 4 hours and it has been operating faultlessly since December 1981. The built-in test routines can be used for checking without change.

The advantages of the equipment are low energy and small space requirements (leaving out the expansion cabinet), great reliability, simple and convenient organizing ability and, last but not least, the cheap price.

After coming to an agreement with the manufacturer it will be possible to provide our domestic users with 8,371 remote data processing processors supplied with semiconductor stores.

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EXPERIENCE WITH THE ES 1055 IN ONE YEAR OF USE

Budapest SZAMITASTECHNIKA in Hungarian No 7-8, Jul Aug 82 pp 10-11

[Article by Mrs Endre Selenyi: "The First Domestic ES 1055 Is One Year Old"]

[Text] Putting into operation and handing over the SZAMALK [Computer Technology Applications Enterprise] ES 1055 computer system was completed on 2 February 1981.

The computer system, based on a quite confined but very modern central unit, began work in two shifts. The goal of the first 2 months' work was an exchange of experiences with or on-the-job training of operating experts, already prepared in theory but hardly having any practice.

The characteristic parts of the initial configuration were: 1 M byte central storage (ES 1055); two card readers (ES 6012, ES 6019); two line printers (ES 7033M); five 29 M byte magnetic disks (ES 5061); and five magnetic tapes (ES 5017).

The operating system used was OS/ES 6.1 M 4 in the SVS mode. The hardware configuration hardly made use of the advantages of the ESZR [Uniform Computer Technology System] series 2, but it was suitable for the discovery and solution of many problems and for preparing to start "live" operation.

Since 1 April 1981 the services of the computer center have been available in an operational way for external and internal users. Within a short time the initial hardware configuration was expanded with a six unit 100 M byte capacity magnetic disk system and a TELE JS remote processing system (ES 8371.01 processor, two remote group control 4-4 terminals and four independent remote terminals). We used an OS/ES 6.1 M 4 operating system in the SVS mode, which was delivered by Robotron with the computer. We successfully fitted into the system an IDMS data base management system.

We also tested Shadow and Task Master remote data processing monitors under the control of the OS/ES 6.1. In the interest of more efficient operation we experimented with building in HASP II, but this did not give the desired results due to deviations appearing in the supervisor.

The 6.1 M 4 version did not ensure adequate servicing of the TELE JS remote processing system because it contains neither the CRJE or the TSO possibilities. (According to information received from Robotron an M 8 version will be ready by the end of 1982; it will include a time sharing system also.)

We would have liked to realize conversational mode machine use with developed remote data processing devices but this can be achieved--for the above reasons--only by changing the operating system. At the end of October, after a brief preparation, we switched to an operating system corresponding to the SVS version of the IBM OS/VS2 1.7 J. The spooling technique used in the system is the HASP II and time sharing operation makes possible programming in the conversational mode. Use of TSO in the ES 8371.01 programmable multiplexor emulator mode now serves eight lines, physically constructed. In a brief time the favorable services of the time sharing system came into the center of user interest. The number of terminals today is still small so we have planned acquisition of new terminals and will ensure the possibility that our customers can connect their own terminals to our computer system.

One of the services of the computer center is to provide tools for system compatilibity tests so that a number of users have experimented successfully with generation of various operating systems for developmental and research purposes.

In figure one we see a graph of technical utilizability. The values depicted represent system downtime in percent of all connected time without maintenance. The average technical utilizability for the year of 96.58 percent is outstandingly good, compared to the same index for similar systems. The good training of the technical operating personnel and the quick customer service assistance offered on occasion by Robotron contribute to achieving such a high value.

[Figure 1, 2 inches, has a vertical scale in percent and a horizontal scale in months]

Figure two shows the average mean time between failures pertaining to the breakdown of the system. It is worthy of note that the figure for the system is 57.6 hours but that for the central unit is 135.8 hours.

[Figure 2, 2 inches, has a vertical scale in hours and a horizontal scale in months]

In figure three we can see the average time needed for restoration after the breakdown of the system (MTTR).

[Figure 3, 2 inches, has a vertical scale in hours and a horizontal scale in months]

The more frequent failures worthy of note on the basis of the past year's experiences are:

--a one bit store error in operational storage. (The hardware can correct a one bit error, but this is accompanied by a substantial reduction in operating speed, so it is useful to eliminate the error quickly.)

--a grounding fault in the power unit of the integrated operator's console. (It took a long time to find the cause.)

--contact faults in the printer belonging to the integrated console. (Because of the many faults, difficult to repair, it is useful to disconnect use of the line printer from the system, which does not cause a problem with the OS system.)

--among the peripherals, the photo diode signal generators and the photo diodes of the reading head frequently failed in the ES 6019 card reader.

Naturally, we informed the manufacturing firm about the frequent failures and we received a promise that these would be eliminated in later equipment.

It is worthy of note that the manufacturer still does not always follow up the hardware precisely. This meant modifying certain circuits of the central unit, which is necessary on the one hand to connect additional peripherals and also, on the other hand, to ensure that the hardware always works in harmony with the software.

In general the hardware and software design of the computer system is good. The technical indexes are above the average. The software system needs to be supplemented, but Robotron recognizes this fact and is constantly making up the deficiencies.

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CSO: 2502/2

CEMA COOPERATION IN DEVELOPMENT, USE OF MICROCOMPUTERS

Budapest SZAMITASTECHNIKA in Hungarian No 7-8, Jul-Aug 82 p 12

[Article by Dr Tamas Boromisza and Karoly Stuka: "Microcomputer Development and Applications Cooperation in CEMA"]

[Text] The 36th session of CEMA was held in our homeland. In addition to a discussion of many important questions there was the signing, at the head of government level, of three agreements which have a connection to our special area.

The joint development of robots also requires the use of computer technology methods and tools while the cooperation agreement signed in the area of the microelectronics element base is called upon to ensure a better supply of parts for the computer technology industries of the socialist countries. But computer technology is most affected by the agreement which prescribes multilateral cooperation of the CEMA member countries in the area of the use of microcomputers.

Just one year ago the preceding session of CEMA decided on the preparation of such an agreement. Preparation was entrusted to the Inter-Government Computer Technology Committee, the Radio-Electronics Permanent Committee and a number of other CEMA and international economic organizations, with the coordination of the CEMA Scientific and Technical Cooperation Committees. Solution of this task in not quite one year, a task mobilizing so many high level organizations, can be called a significant accomplishment.

The work is now being transferred from the consulting delegations to applications experts working in the most varied areas.

Attached to the agreement is a work program which contains the task to be realized in the course of the cooperation. The most important part of the program prescribes those tasks of extraordinary importance if we are to be able to follow the explosive spread of microprocessor devices in the past 2-3 years in the developed capitalist countries. We must jointly review the status of the use of microprocessor devices in our member countries and determine the short and long term phases of development.

Of extraordinary importance are those tasks which prescribe an analysis and forecasting of the social and economic consequences to follow as a result of the mass use of microprocessor devices. While the social consequences of the application of computer technology thus far could be handled relatively simply, in the more or less closed circle of experts, the appearance of microcomputers in tens of thousands, and building microcomputer controls into virtually every technical device represent processes of truly social scale. A suitable forecasting of these processes is absolutely necessary and it is of political significance that every affected area of society be prepared in time for the changes. We must organize the training and guidance of masses of users. The program prescribes mutual tasks and exchange of experiences in this area also.

Although all the things listed are important, we consider most important the formulation of the general technical requirements to be made of the basic tools of microprocessor technology, which leads us to the next part of the program. Any sort of cooperation would become impossible in an area as various as the use of microprocessors if we were not able to apply uniform technical requirements and to standardize the solutions.

The most extensive part of the cooperation program deals with the most varied economic applications of systems containing microprocessor devices.

Let us mention only briefly a few product groups to give a feeling for the broad area embraced by the program. The number of various systems exceeds 100, and it is probable that with the spread of the use of microprocessors this number will increase further.

Microprocessor control of technological systems extends to control of gas supply, the cement industry, manufacture of chemical industry machines and control of thermal power plants. This includes control systems which may be used in electric power networks, nuclear reactors, purification and enrichment of metal ores and general purpose control systems which may be used in a broad sphere.

The most varied areas of economic life also use organizational, operational planning and dispatcher systems, beginning with microprocessor optimalization of technological services to surface mining through savings banks, commercial and telecommunications registering and auditing equipment and cash registers all the way to text editing equipment.

The development of modern controls containing microprocessors for the control of machines, mechanisms and machine tools constitutes a large group, in which our homeland also has undertaken a significant part. In addition to customary and well known NC, CNC, and group controls there are many others here also: weaving machine controls, industrial sewing machines, systems to control manufacture of turbine blades and automatic testing and diagnostic equipment.

The part dealing with automatic industrial, scientific and medical instruments can also count on serious interest in our country. In addition to medical instruments the microprocessor increase of the intelligence of various weighing equipment is an interesting theme.

In the area of microprocessor applications for transportation equipment we find ignition and motor controls and instrument panels for passenger cars and trucks, special autobus controls, microcomputer guidance systems for urban, highway, rail, water and air transportation and various reservation systems. A kindred area is the use of microprocessors in various telecommunications systems.

Agriculture is of increasing significance for microprocessor applications--guidance systems for small agricultural enterprises, control of various technological processes in industrial scale animal husbandry, sorting agricultural products according to quality, hot houses, agrometeorological equipment, irrigation systems and the packaging of products.

Of special importance in the present situation are microprocessor applications systems for fuel and energy systems, where any saving we can achieve with these systems is of economic interest.

The same thing applies to various metallurgical applications. Mass use of educational and personal entertainment microcomputers also figures in the program.

One can see even from this sketchy listing what a ramified area the use of microprocessors is even today. So the program does not propose that a single international organization should deal with all these questions. Use of microprocessors in every single area already means the same thing as general technical progress; the representatives of not one single area can refrain from active participation in this process, cannot say that this is a matter for computer technology and microelectronic experts. The program makes the organization of cooperation in developing individual applications systems the task of the individual branch permanent committees and international management organizations. The program or rather a temporary work group entrusted with guidance of execution will do the work.

Hereafter also, ensuring the device base needed for the realization of microprocessor applications systems will be the task of the two main Design Councils (hardware and software) of the Inter-Government Computer Technology Committee. The Applications Council for Computer Technology Devices working within the framework of the Inter-Government Computer Technology Committee is undertaking to discover effective applications areas on the basis of a summing up of experiences in the application of microprocessor technology, defining the basic requirements to be made of devices and working out the technical, manufacturing, legal and commercial conditions for software development and supply.

The program also formulates a few requirements where it will be necessary to set forward the originally given time limits or to expand the previous catalog (for example, in the area of micro-peripherals). We must substantially improve information for the large number of experts working on the creation of microprocessor systems, concerning circuit elements, peripherals and other devices which can be obtained from the socialist relationship.

Another essential part of the program is the chapter which deals with questions of education. This part applies to higher and middle level education and to institutional and study course instruction alike. It extends to developers and users of applications systems; the latter represent very much great masses of people. In addition to a joint development of and exchange of experiences concerning study plans and methodological materials, the program prescribes the use of microprocessor technology in general school instruction and designates the chief directions of cooperation in the area of further training for leading cadres.

The microcomputer applications agreement and the work program for cooperation are aimed at an area which is not only very ramified but which is also developing very quickly. Thus it is of priority importance that the program be open and that it be the obligation of every participating international organization to see to constant actualization and further development in its own area.

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COMPUTERS IN DECISION MAKING

Budapest SZAMITASTECHNIKA in Hungarian No 7-8, Jul-Aug 82 p 14

[Article by Agnes Jakab: "The Mission of Informatics Experts Is Disciplined Service To Laying the Foundations for Decision Making"]

[Excerpt] The fifth meeting of informatics experts was held 10-11 June this year in Esztergom. In his talk titled "The Role of the State Administration Informatics Development Society (AIFT) in Developing and Coordinating Economic Information Systems" Laszlo Haklar called the attention of the audience to why, how and within what frameworks this relatively new association was working. The AIFT was formed in May 1981 at the initiative of the president of the KSH [Central Statistics Office], an initiative begun in the first quarter of 1980 in the wake of the 29 November 1979 Council of Ministers resolution calling for the modernization of state administration. It was created not as an interest protection or advisory organ and not from prestige or state administrative (executive) considerations, but rather to aid the practical solution of concrete informatics tasks. So, "Let us not merely propound systems theory, but rather let us see that we are all parts of a larger system. We must do precisely as much as we must do from the viewpoint of the system as a whole." Let us not argue further and let us not frustrate each other's actions when, for example, deciding who will collect the data. It is obvious that each area is capable of controlling its input so others are not needed (and should not be forced) to do it in their stead. Consistent data files should be stored only by the various data owners. Data bases and processing (information) systems must be built up to supplement one another; system developers must work in harmony with one another. Thus, the goal was to liquidate the greatest deficiency. This is what the members of this association undertook also and already they have some nice achievements behind them on the basis of a 3-year and operational work plan; they are spreading these and they invite everyone into the common shop who might be interested in the creation of "optimalized" economic information systems. It is already a great accomplishment if these specialized informatics institutions get to know one another, their professional traditions and ideas. Since the content and concepts of economic information are not yet fully developed, one should first record the data, then order the conceptual base and finally adjust them to changes taking various parameters into consideration.

The task is of great significance. The transmitter of the economic policy goals of the state is the economic mechanism which also, ultimately, is a manifestational form of economic relationships. The information system must always provide the mechanism with the necessary input, and this is now more difficult with the value orientation which goes beyond the quantitative view. The most important areas in which providing information is indispensable for the preparation of decisions are: watching and supporting the price mechanism; laying the foundations for the credibility of the most varied international comparisons, making the producing sectors sensitive to changes in terms of trade, etc.

Information, the "most perishable commodity," must be in spatial, temporal and substantive synchrony with the decision levels. For the users it must be used as a "finished product." It is insupportable for an organ making a decision to believe itself informed although its information is extraordinarily deficient (through no fault of its own). And since economic and state administrative functions are, by their nature, divided, the information system must develop functional, branch and regional part-systems. It cannot do this without a system of identification, grouping and documentation. Computerized data management itself, as a technique, also demands a mutually unambiguous formulation of all elements which are components of a computerized information system (in other words, a data base system).

What does the AIFT want to do for all this?

Only sketchily, to coordinate the part-systems substantively and logically within 2 years. Within 4-5 years the part data bases will be mutually accessible.

In detail:

--to prepare a uniform data catalog, to describe the primary data files in a way which can be used by everyone involved. This is planned as a publication and in a machine (on-line) version.

--to standardize magnetic tape data flow. To give an answer to every concrete question which asks: How can certain information be accessed? (Who has it?)

--and to harmonize the record keeping of managing organizations, which now can be found in three places--but which were never compatible with one another. This step, which is called upon to put an end to "one of the disgraces of the informatics society," leads also to the question of data security, which in itself is an exciting problem, but especially in connection with preparation for the integration of the entire system. (Let us just think what would happen in this connection if we could "borrow" from our partners not only data but procedures also, and all this will become an everyday practice in a remote data processing network.... And the job before us seems especially great if we cannot postpone a solution at the level of procedures beyond the decade!)

In concluding his horizon broadening list of task specifications Laszlo Haklar also mentioned the tasks of the association coming from outside. These expectations reflect the support of governmental and authoritative organs--we might even say a prior positive evaluation of and trust in the work. The State Plan Committee

hopes that through the AIFT the finalization and delimitation of the data content of the part-systems will be more diligently done. The authorities also expect the association to encourage execution of the 1981-1985 target program of the SZKFP [Computer Technology Central Development Program]. The coordination of computerized activities could improve their influence on the members, primarily in the sense of winning a considerable number of colleagues to the common cause, to successfully bridge the gap between theory and practice.

Realizing the goals and plans outlined projects a very beautiful picture of the future for all of us. But let us look at those flagstones which we are now laying on the road before us. (A volume containing the material of the conference will soon appear, making a detailed review possible. Here and now we can create only the illusion of a lightning survey.)

According to the evaluation of Imre Toth, director of the Computer Technology Center of the OT [National Plan Office], there is a bottleneck from the viewpoint of factual data (the initial information for planning), there is a shortage of branch analyzed data. What there is has a long through-put time, and so is suitable only for long-range planning. For annual and medium-range planning one would need to have information appearing directly, in a visual form; this was formulated as a computer technology requirement. He is encouraging his own development--primarily of software--in the direction of permitting planners to use a computer as a natural tool, having to master a minimum of computer technology information. (Among other things, they have developed a planning language.)

The report by Dr Laszlo Ormai ended with a reassuring announcement. He informed everyone that the two decades long feud of statisticians and computer technologists had calmed down, and this was thanks primarily to developed data management techniques. Thus it is now a realistic requirement that even statistical activity should be economical. In the course of developing data bases problems came to the surface which held back further progress, and all this can be traced back to the lack of integration. For years the internal lack of proportion of the data collection system also held back development. It is an unfavorable fact that the (traditional) observations according to organization are still not always supplemented by observations according to activity or even region. We cannot expect the commencement of the age of interlinked, common use economic and statistical data bases within 5 years, but its realization as soon as possible is hastened with every developmental step. Until then, however, we have enough to think about. What is the optimal size of a data collection system? What sort of realities (data service load-bearing capacity) determine the possibilities and expectations of the statistical organization? What should be the organizational structure, compatible with modern methods, taking the place of the statistical apparatus adjusted to traditional tasks?

The answer to the last question is evident to the extent that the ratios in the division of labor will shift toward functionality. It is also clear that the development of regional systems will bring with it local solution of data control. The rest (to use the words of the speaker) will depend on when the statisticians establish with computer technology tools the sort of relationship they have with their cars or telephones--but with much less irritation. (This is a good lesson, I think, for both sides....)

In what follows I will recommend for perusal a few of the many interesting themes, when you get the promised SKV publication. (I am encouraged to this subjectivism on the basis of the debates and the--perhaps not misunderstood--statements of the section leaders.)

Mrs Lajos Apatfalvi, "Record Keeping Systems of Managing Organizations and Their Links With the Financial Information System." Domonkos Asztalos, Jr and Bela Kreko, "AMETIST, A Conception for a Meta-Information System." Mrs Lajos Baracza and Peter Kulcsar, "Experiences in Realizing a Statistical Data Documentation System." Raimund Blazsik, "Problems in Developing and Operating State Administrative Data Processing Systems for the Councils." Ervin Gombos and Dr Mrs Istvan Weisz, "Administrative Aspects of a Contemporary Data Protection System." Imre Hajdu, "Developmental Possibilities and Constraints of an Identification System for Economic Organizations." Gabriella Koncz and Mrs Imre Pal, "Problems of Building a Link Between the Financial Information System and the State Administrative Information System." Imre Pap, "Experiences in Census Data Processing and a Conception for a Census Data Base." Mrs Karoly Patyi and Lorant Santa, "A Geodetic and Cartographic Data Base; A Uniform National Identification System Based on Geodetic Coordinates." Dr Jozsef Stauber, "Further Development of a Legal Information System Based on a Computer." And Robert Villanyi, "The Role of the PSZTI [expansion unknown, possibly "Postal Computer Technology Institute"] in Data Exchange."

Finally, let me summarize a few ideas and proposals from the second plenary session.

Attila Aranyi, chairman of the section on record keeping by managing organizations: Increased attention must be given to the record keeping problems of the multiplying organizations (including social ones) and the new types of undertakings among them including joint undertakings by cooperatives and the state. We must avoid the danger of biased judgment.

Dro Gabor Parniczky, chairman of the section on statistical meta-information systems: Metasystems have a powerful regulating power. For this reason it is very important, although difficult, to solve the problem pragmatically. There should not be incompatible classification systems and we must eliminate redundancy (at the element, procedural and subsystem levels).

Dr Istvan Vavro, chairman of the section on regional and local information systems: Since council work is a carrier of administrative conservatism the reception of new tools is clumsy. For this reason it is especially important to prepare in time so that changes in regulations affecting this sort of activity should have a significant influence on the efficiency of storage and access structures in the information system.

Dr Jozsef Kovacsics, chairman of the section on state administrative base records: Principles, methods and regulations still lag behind the real needs in the question of data protection and data security. This theme is extraordinarily important for every informatics-computer technology area. Development can only lead through settlement of these questions.

Dr Jonas Szelezsan, chairman of the section on branch information systems: The fact that a common conclusion cannot be given on the basis of the reports concerning branch information systems confirms that the mammoth systems being prepared separately thus far must be developed as subsystems.

Elek Straub, chairman of the section on the planning and financial information system, emphasized, in harmony with the other chairmen, that: The indisputable usefulness of the conference for a mutual exchange of information will be fuller if the debates could "run their course." Unfortunately there was not enough time for this in any of the sections. (This would be absolutely necessary for the proper storage of the ideas expressed.)

It is probable that Lajos Pesti intended it as an orientation so let me give his closing words a bit more extensively. Their content is noteworthy as a sort of "collective self-criticism." He said: "We have committed two errors. First, 20 years ago, we did not begin teaching computer technology and informatics. And, 10 years ago, we did not put forward an information system development program in the pace of the SZKFP [Computer Technology Central Development Program]. It is reassuring that for a few years the emphasis has been shifting toward the organization of systems or toward the methods for this."

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REPORT ON SCIENCE SITUATION ASSESSED

Warsaw TRYBUNA LUDU in Polish 20 Sep 82 p 3

[Interview with Professor Ignacy Malecki of the Polish Academy of Sciences by Adam Hollanek]

[Text] The Polish Academy of Sciences has prepared a new professional report--as though in response to the hopes which our society attaches now, during the crisis, to the development of scientific research and also to the introduction of new methods and technologies into the national economy. "Report on the Polish Science Situation" was prepared under the direction of Prof Dr Ignacy Malecki.

[Question] Comrade Professor, what do you consider as the most essential in this analysis of the actual state of our science? Is this only an assessment of the present situation?

[Answer] I think that, during the work of the team which was preparing this report, the matter of presenting and submitting to the scientific community for discussion both the analysis of the present state of science as well as programmatic suggestions for the future came to a head. It would have been difficult not to draw conclusions from what we have studied and what we are trying to assess honestly and critically. Initial discussion will begin shortly in the Science Study Committee of the Polish Academy of Sciences. In the report we have attempted, probably for the first time in such a comprehensive way, to present the capabilities and needs of science in relation to its available means. And all this against the background of import and ambitious research programs.

A second, very essential field, which we have delved into, is the presentation of the mechanisms of putting of scientific research into practical application and the difficulties in accomplishing such tasks. Major errors of scientific policies in many recent years still linger on. For example, the insufficient participation of the considerable, after all, research and developmental potential of our country in the innovative processes was not justified by the state of Polish research. The orders-distribution system has led to a decline in the autonomy of units in the national economy that was, of course, obscuring the picture of the actual needs of those units as far as the flow of

scientific innovations was concerned and was complicating the cooperation of scientists with industry. In the report we have also enumerated various other aspects of this problem. It presents a very differentiated picture of our science which has to its credit many accomplishments acknowledged in the world but which, at the same time, often cannot fulfill the expectations of the economy and of society. Of course, it must be stressed at the same time that science of a medium-size country cannot possess a panaceum for all the ills which plague us. Science, after all, should be viewed as an integral part of the life of the whole country. This is indispensable.

[Question] Is it true that there is a very large disproportion between the level and the capabilities of our scientific cadre and the material base available to it?

[Answer] I consider, and our report stresses this also that the development of a cadre of scientists of a really high caliber is to be one of the greater accomplishments of our country. This is a great trump card. It is true that the material base of our science is very, very weak. The result is that experimental research (important, after all, both indirectly and directly for practical application) is of an extensive nature and is dispersed. Hence, it is not very effective. In my opinion, however, the weak material base is a lesser evil than a weak education would be of some small cadre of scientists. Searching for persons suitable for science and educating them involves many decades. Nonetheless, the material base can and should be, of course, improved quickly. In 1980 more than 70 thousand personnel having the highest scientific qualifications was listed. Unfortunately, educating of the cadre has slowed down. It is caused by the continuing limitations in employment. Because of it fewer young people manage to reach the centers of scientific research. The fault, of course, is primarily the lack of experimental workshops. Thus a vicious circle is formed. And here one should expect significant help from autonomous economic units. After all, developing of contacts with science is in their own interest, i.e., the outfitting of new laboratories by using at least a small portion of foreign exchange which they have earned. In other words, we are counting on large enterprises!

[Question] Among the many issues, which required a thorough study and a change of strategy is, no doubt, the question of appreciating and supporting basic research without which any development of science is simply impossible. How does the report treat this problem and what formulas does it propose?

[Answer] In all fields of science the report attempts to propose actions which would at least alleviate our difficulties. Those actions are to be based on an appropriate strategy of scientific research--that means in this instance--on a careful choice of direction of scientific research and of the degree of concentration of forces and means for chosen problems. In the report we write that "coverage of the entire field of science with only a thin layer of resources in such a way as to assure at least a minimum degree of conducting scientific research is proposed." As one can see, action on a wide front is assumed so that each one of our scientists could have his "place in the sun." This obviously pertains also to basic research. At the same time we postulate in the report the selection of a few of the most important problems of a wide, comprehensive scope that allows for maximum utilization of the potential of both the basic and technical disciplines. This is not supposed to be some rigid

structure, a bureaucratic or overly technical structure (as it happens frequently, for example, with governmental problems). It is to be a broadly conceived concentration of scientific activity on the problems most essential for our society. Here are some examples. It appears to us that the most important matters include the modernization and reconstruction of the labor system: wage systems; labor incentive; land labor law; and employment policy. In this field there is a need for a particularly great effort by science and also for frequently conducting really pioneer-type--in our country--research.

Another great problem is, "the organization of management of the state." "Only on the basis of solid scientific research there is the guarantee of avoiding glaring errors committed in the past in constructing and operating management systems"--as we state in the report. The third important sector is based on "the maintenance and rational utilization of national wealth." Of course, there is an enormous role to be played and an enormous field for action for many scientific disciplines, including particularly the heretofore neglected social sciences.

Among the basic problems one should also consider "improvement in the production and processing of agricultural products." This is a classical example of versatility of scientific activities.

Here one assume that its role is not only to solve the problems of agricultural products--just the agricultural sciences--but also the social, biological, technical problems. Here the concern is for the best cadre of those who are to work in agriculture, as well as for the production of improved fertilizers, insecticides and implements, for food processing, and for waste utilization. One also should not forget about basic research in photosynthesis, in biological assimilation of nitrogen from the air and in genetic engineering which opens new perspectives for agriculture.

Problems of similar degree of complexity that require the cooperation of many innovators of science include: "rationalization of the management of raw materials"; "territorial development of the country"; "environmental protection"; "protection of the nation's health"; and "rationalization of exports and imports." One cannot list here everything.

There is no doubt, however, that such comprehensive solutions of this science strategy must be accompanied by a very carefully considered financial policy. Organizational-unit [plant and equipment] financing, that is, financing of selected research units, will probably be even more concentrated than that up to this time. The source for it is to be a state fund and a fund centrally managed and originating from taxes and from other forms of charges from enterprises. This type of financing should include all three branches of science. Organizational-unit financing consists of appropriating of monies to specific centers or teams which show promise for positive results in research. We are proposing that it should have its source in that part which is managed primarily by the Polish Academy of Sciences and the Ministry of Science. The third form of financing research would be the contracts concluded by individual enterprises and scientific centers.

Centers which carry out research for the enterpirses should become financially fully independent or should even become permanently connected with the enterprises of the national economy. We envisage the participation of special scientific entities, such as the Council of the Fund for Basic Research or the Council of the Fund for Technical Progress, in the equitable appropriation of funding for science. They would be a factor which would democratize financial decisions and would facilitate identification of actual needs of individual scientific disciplines or individual centers of scientific research.

Discussion of these matters is just beginning in the scientific community.

Interviewer: Adam Hollanek

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